Water Reuse and ZLD Technologies

Gasification Technologies Conference 2011
Presentation

- Traditional Wastewater Management Strategy
- Water Recycle and Re-use
- Conventional Industrial Wastewater Treatment
- Zero Liquid Discharge
- New ZLD Technology – The CoLD™ Process
- CoLD ZLD Systems in Gasification Plants
Water and Carbon Footprint Reduction

Veolia Water is Committed to Supporting our Customers to Achieve Their Sustainable Visions

Our Focus is on Delivering:

- Improved operations
- Reduced costs
- Neutral or positive energy solutions
- Solutions which utilize green chemicals or zero chemical consumption
- Water-footprint-efficient technologies with high recovery rates
Traditional Wastewater Effluent Strategy

► Reduce volume through segregation and re-use.
► Staged treatment is a function of outlet quality required
  • Primary treatment: solids separation
  • Secondary treatment: bio-treating
  • Tertiary treatment: membrane filtration / RO
  • Effluent recovery: evaporation / crystallization
Water Re-use from Cooling Tower Blowdown to HP Boiler Make-up Water, South Africa CTL Plant, (delivered 2006)
Water Re-use from Cooling Tower Blowdown to HP Boiler Make-up Water, South Africa CTL Plant, (delivered 2006)

- Scope of Supply: EPC Contract

- General Project description
  - Cooling Water reclaim to feed CTL plant

- Technology
  - Multiflo (TSS removal)
  - Multiflo (lime softening)
  - MF/UF
  - Reverse Osmosis
  - Polishing on MB exchangers

- Capacity
  - Flow-rate: 3 x 250 m³/hr (12,000 m³/d)

- Year: 2006
Wastewater Treatment, CTC Plant, South Africa (delivered 2005)

- Wastewater treatment system required for very toxic influent
  - 15 000 mg/L COD/2 000 mg/l phenols/ 1 000 mg/L ammonia/CN and toxic metals particles
- Pre-Treatment of Organic material in MBBR, Polishing of remaining organics and nitrification of ammonia in PAC

[Diagram showing the wastewater treatment process]

- Influent
- Equalization tank
- API separator
- Dissolved Air Flotator
- Moving bed bioreactor
- Powdered Active Carbon reactor
- Chemical oxidation
- Product water
- Filter press
- Sludge
Wastewater Treatment, CTC Plant, South Africa, 2005
Typical Zero Liquid Discharge (ZLD) Objectives

**System Objectives**
- Eliminate liquid waste
- Generate landfillable solids
- Generate high-quality water for reuse in upstream processes

**Design Objectives**
- Minimize capital and operating costs
- Minimize manpower requirements
- Safe, simple, and reliable system operation
- Maximum flexibility (turndown capability)
- Accommodate frequent start-ups, shut-downs, and periods of stand-by operation
Water Re-use with Zero Liquid Discharge – Gas to Liquids Plant, Qatar

Overall Scheme of Main Units and Flows:

- Hot HPS Water: 3790 t/day
- AOC / COC: 8480 t/day
- Stripper water: 15287 t/day
- Blow Down: 7512 t/day

UNIT 8200: DRAINAGE, COLLECTION, & PRIMARY TREATMENT (DCPT)

UNIT 8300: EFFLUENT TREATMENT PLANT and ZERO LIQUID DISCHARGE (ETP/ ZLD)

UNITS 7131 & 7141: COOLING WATER BLOW DOWN (CWBD)

- Various Waste Streams (S & L): 136 t/day
- Irrigation water: 1200 t/day
- Raw water: 32203 t/day
- Cooling water: 8089 t/day

Note: Ratio of raw water to cooling water can be adjusted
3D Model – Overview (ZLD AREA)
Evaporators A/B/C
Conventional ZLD for IGCC Grey Water

NH₄Cl & HCO₂H

Pretreatment

Evaporation

Proposed IGCC Grey Water ZLD System
CoLD™ Process

Crystallization of high solubility salts at Low Temperature and Deep Vacuum
Past Practice

Chemicals

Pretreatment

Evaporation/Crystallization

Separation

Water

Sludge

Solids

Drying

Solids
CoLD™ Process

- Pretreatment
- CoLD™ Crystallization
- Separation
- Drying

Chemicals
- Sludge

Water
- Solids

Solids
Advantages of CoLD™ Process

► No Chemicals, Less Sludge

► Lower Energy Requirement

► Simple System, Less Operator Attention

► Robust System

► Lower Capital Cost
ZLD System for IGCC Power Plant - USA (Start-up 2012)

- 630 MW IGCC Power Facility
- Zero Liquid Discharge System by HPD **Includes two CoLD™ Crystallizers**
- Produces Clean Water for Discharge and Dry Salt for Landfill
ZLD System for IGCC Power Plant – Spain (Start-up 2012)

- 335 MW IGCC Power Facility
- Zero Liquid Discharge System by HPD Includes CoLD™ Crystallizer
- Produces Clean Water for Re-use and Dry Salt for Landfill Disposal
CONCLUSION

Water management systems may be designed

- To comply with highest environmental standards
- To minimize water impact on environment
- To allow sustainable development
Thank you!